Virginia DOT Weather-Related Incident Detection

The Virginia Department of Transportation (DOT) operates an Advanced Traffic Management System (ATMS) to control the highway network in Northern Virginia. The ATMS includes an Incident Detection subsystem and a Closed Circuit Television (CCTV) subsystem, which are used for traffic and road condition surveillance on 27 miles (43.4 kilometers) of Interstate 66 and nearly 29 miles (46.6 kilometers) of Interstate 395. Traffic managers are able to modify incident detection parameters based upon observed weather conditions.

System Components: The Incident Detection subsystem is comprised of inductive loop detectors, Type 170 controllers housed in roadside cabinets, and a central incident detection computer. Traffic flow data is collected at over 120 vehicle detection sites installed every half mile (0.8 kilometers) along the freeways. The CCTV subsystem includes over 50 cameras, video transmission devices, and three monitor walls for display of video images. Fiber optic cable and coaxial cable communication systems transmit data and video from the field to control computers in the Smart Traffic Center (STC) located in Arlington.

System Operations: Incident detection computer software contains statistical algorithms that continuously analyze field data to identify traffic flow disruptions caused by incidents. Traffic managers may select databases containing detection algorithms for "clear", "rainy" or "snowy" conditions. When rain or snow events are observed on the monitor walls traffic managers access the incident detection computer and select the detection database most appropriate for prevailing conditions. The CCTV subsystem is also used to visually verify detected incidents and support incident management activities.

Transportation Outcome: Use of algorithms tailored to specific weather events improves roadway mobility and safety by facilitating incident detection under non-ideal conditions. Weather-related incident detection enhances mobility by minimizing response time and traffic delays associated with temporary capacity reductions. Safety is improved through expedited incident response and clearance, which reduce the risk of secondary crashes.

Implementation Issues: The Virginia DOT contracted with a consulting firm to design, install, and integrate ATMS components and subsystems. In 1985 system integration and testing efforts were completed and the STC began operating. The ATMS was expanded in 1999 through the deployment of additional monitoring, control, and communication devices along Interstates 66 and 95.

Hardware and software components in the STC were upgraded in 2000. The original mainframe computer was replaced with redundant servers. New operator workstations and video walls were also installed. In the future, the DOT plans to expand weather-related incident detection capabilities to Interstate 495 (i.e., the Capital Beltway) and plans to integrate the ATMS with research facilities at the University of Virginia.

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Keywords: rain, snow, pavement condition, weather-related incident detection, freeway management, control strategy, incidents, vehicle detection, closed circuit television (CCTV), safety, mobility